

# Gifted and Talented Education



## Year 7 Mathematics

### Polyominoes

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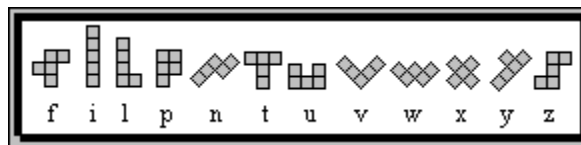






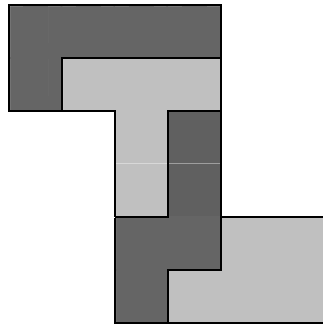


6. Duplication problems:  
Each pentomino is referred to by the letter it resembles.



(<http://www.puzzlecraft.com/solutions/pent/pentom/pentomin.html>)

Four of the pieces can be used to make a Z twice as large as the original Z piece as illustrated below.



- f) Duplicate the other pentominoes in a similar way.  
g) There are two pentominoes that cannot be duplicated. Which ones are they?
7. Triplication problems:  
Select any one of the pentominoes. Using only 9 of the remaining 11 pentominoes construct a shape, which is 3 times as large as the original.
8. Investigate the relationship between the areas of the original pentomino, its duplication and its triplication. What conclusions can be made? Investigate if this conclusion can be applied to shapes other than pentominoes.
9. Matching problems:  
h) Two pentominoes can be fitted together to make a shape and then 2 *other* pentominoes can be fitted together to make the same shape. Show how I and L can be fitted together to make the same shape as W and N.  
i) Find other pairs of pentominoes that can be matched in this way.
10. Dominoes are shapes that use two squares joined edge to edge. In a set of dominoes, the pairs of squares are then numbered using the digits 1 to 6 so that no domino is numbered in the same way.  
j) How many dominoes are in a set?  
k) Play the game of *Dominoes* and any of its variations.
11. The commercial game of *Tri-Ominos* does not really use triominoes.  
l) Explain why this is so.  
m) Play the commercial game of *Tri-Ominos*.  
n) Search the Internet to find information about triominoes.  
o) Use triominoes to develop a game.
12. Search the Internet for any other information on polyominoes. Find other problems involving polyominoes and present their solutions.

## Assessment

Students undertaking this unit should record their work in a learning journal. In keeping this journal, students should be encouraged to record:

- solutions to the problems
- strategies used to solve the problems
- reflections on their thinking
- ideas for future exploration

This learning journal could then be used to assess student achievement of learning outcomes.

Students could also be asked to present their findings in a 10 minute presentation incorporating ICT.

The following is suggested as a means of assessing student learning:

Outstanding achievement will be evidenced by:

- multiple solutions to many problems
- excellent use of mathematical terminology in communicating concepts
- comprehensive explanations of the thinking employed throughout the problem solving process
- some ideas for future investigation

Good achievement will be evidenced by:

- multiple solutions to some problems
- good use of mathematical terminology in communicating concepts
- some explanation of the thinking employed throughout the problem solving process

Minimum achievement will be evidenced by:

- solutions to some problems
- some use of mathematical terminology in communicating concepts
- limited explanation of the thinking employed throughout the problem solving process

## References

*Mathematics Years 7-10 syllabus* (2002) Board of Studies NSW, Sydney.

Patjitnov, A. (c1986). *Tetris*, viewed 19 August 2005, [www.neave.com/games/tetris/](http://www.neave.com/games/tetris/)

## Resources

Centre for Innovation in Mathematics Teaching, University of Exeter (2004) *Pentominoes – an introduction*, viewed 19 August 2005, <http://www.cimt.plymouth.ac.uk/>,

Gardner, M. (1959) *Mathematical puzzles and diversions*, New York, Pelican.

Jenicek, J. (2001) *The pentominoes page*, viewed 19 August 2005, <http://www.puzzlecraft.com/solutions/pent/pentom/pentomin.html>

*Pairs of hexominoes in rectangles*, viewed 19 August 2005, <http://clarkjaq.idx.com.au/PolyPages/index.htm?6pairs.htm>

Putter, G. *Gerard's universal polyomino solver*, viewed 19 August 2005, <http://www.xs4all.nl/~gp/PolyominoSolver/Polyomino.html>

Wolfram Reasearch Inc. (1999) *Hexomino*, viewed 19 August 2005, <http://mathworld.wolfram.com/Hexomino.html>

Wolfram Reasearch Inc. (1999) *Polyomino*, viewed 19 August 2005, <http://mathworld.wolfram.com/Polyomino.html>

*Tri-ominoes: the triangular domino game* (1968) Croner Games, Maidstone, Vic.

## Appendix 1: Sample contract

Name: ..... Class: .....  
Teacher: .....  
Unit: .....

I agree to undertake the following activities and complete each task by the date indicated:

### A. Non-negotiable tasks (numbers may vary):

1. ....  
Due date: ..... Date completed: .....  
Student initials: ..... Teacher initials: .....
2. ....  
Due date: ..... Date completed: .....  
Student initials: ..... Teacher initials: .....
3. ....  
Due date: ..... Date completed: .....  
Student initials: ..... Teacher initials: .....
4. ....  
Due date: ..... Date completed: .....  
Student initials: ..... Teacher initials: .....
5. ....  
Due date: ..... Date completed: .....  
Student initials: ..... Teacher initials: .....
6. ....  
Due date: ..... Date completed: .....  
Student initials: ..... Teacher initials: .....

### B. Negotiable tasks (9 numbers may vary):

7. ....  
Due date: ..... Date completed: .....  
Student initials: ..... Teacher initials: .....
8. ....  
Due date: ..... Date completed: .....  
Student initials: ..... Teacher initials: .....
9. ....  
Due date: ..... Date completed: .....  
Student initials: ..... Teacher initials: .....
10. ....  
Due date: ..... Date completed: .....  
Student initials: ..... Teacher initials: .....
11. ....  
Due date: ..... Date completed: .....  
Student initials: ..... Teacher initials: .....
12. ....  
Due date: ..... Date completed: .....  
Student initials: ..... Teacher initials: .....

I agree to complete all tasks as indicated on the above due dates:

Student signature: ..... Date: .....

I agree to provide assistance for .....

Teacher signature: ..... Date: .....

## Appendix 2: Pentominoes

Cut out each of the pentominoes below and then use the pieces to complete the challenges below.

### Challenges:

1. Use the pieces to make a  $5 \times 3$  rectangle.  
Draw at least 2 different solutions in your workbook.
2. Use the pieces to make a  $5 \times 4$  rectangle.  
Draw at least 2 different solutions in your workbook.
3. Use the pieces to make a  $5 \times 5$  square.  
Draw your solution in your workbook.
4. Mega-challenge:  
Fit the 12 pieces together to form rectangles of  $6 \times 10$ ,  $5 \times 12$ ,  $4 \times 15$ ,  $3 \times 20$ .

